General

Guideline Title

The Society of Thoracic Surgeons practice guideline series: antibiotic prophylaxis in cardiac surgery, part II: antibiotic choice.

Bibliographic Source(s)

Engelman R, Shahian D, Shemin R, Guy TS, Bratzler D, Edwards F, Jacobs M, Fernando H, Bridges C, Workforce on Evidence-Based Medicine, Society of Thoracic Surgeons. The Society of Thoracic Surgeons practice guideline series: Antibiotic prophylaxis in cardiac surgery, part II: Antibiotic choice. Ann Thorac Surg. 2007 Apr;83(4):1569-76. [73 references] PubMed

Guideline Status

This is the current release of the guideline.

The Society of Thoracic Surgeons (STS) reaffirmed the currency of the guideline in 2011.

Regulatory Alert

FDA Warning/Regulatory Alert

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- May 12, 2016 – Fluoroquinolone Antibacterial Drugs : The U.S. Food and Drug Administration (FDA) is advising that the serious side effects associated with fluoroquinolone antibacterial drugs generally outweigh the benefits for patients with sinusitis, bronchitis, and uncomplicated urinary tract infections who have other treatment options. For patients with these conditions, fluoroquinolones should be reserved for those who do not have alternative treatment options.

Recommendations

Major Recommendations

The levels of evidence (A-C) and classification of recommendations (I-III) are defined at the end of the "Major Recommendations" field.

Choice of Primary Prophylactic Antibiotic

Cephalosporin or Glycopeptide

Class I Recommendation

A beta-lactam antibiotic is indicated as a single antibiotic of choice for standard cardiac surgical prophylaxis in populations that do not have a high incidence of methicillin-resistant staphylococcus aureus (MRSA) (*Level of Evidence A*).

Distinguishing Between Cephalosporins

Class IIa Recommendation

Based on availability and cost, it is reasonable to use cefazolin (a first generation agent) as the cephalosporin for standard cardiac surgical prophylaxis in view of the fact that most randomized trials could not discriminate between cephalosporins (*Level of Evidence B*).

Issues Surrounding Staphylococcal Infection

Potential (Non-allergic) Indications for Primary or Adjuvant Glycopeptide (Vancomycin) Prophylaxis

Class IIb Recommendation

In the setting of either a presumed or known Staphylococcal colonization, the institutional presence of a "high incidence" of MRSA, patients susceptible to colonization (hospitalized >3 days, transfer from other in-patient facility, already receiving antibiotics), or an operation for a patient having prosthetic valve or vascular graft insertion, it would be reasonable to combine the beta-lactam (cefazolin) with a glycopeptide (vancomycin) for prophylaxis, with the restriction to limit vancomycin to only one or two doses (*Level of Evidence C*).

Vancomycin as the Sole Prophylactic Antibiotic

Class IIb Recommendation

Since vancomycin is an agent which has no effect on gram negative flora, its usefulness as an exclusive agent in cardiac surgical prophylaxis is not recommended (*Level of Evidence C*).

Mupirocin for Preoperative Therapy to Eliminate Staphylococcal Nasal Colonization

Class I Recommendation

Routine mupirocin administration is recommended for all patients undergoing cardiac surgical procedures in the absence of a documented negative testing for Staphylococcal colonization (*Level of Evidence A*).

Guidelines for Appropriate Dosing of Prophylactic Antibiotics

Recommendations:

In patients for whom cefazolin is the appropriate prophylactic antibiotic for cardiac surgery, administration within 60 minutes of the skin incision is indicated (*Class I, Level of Evidence A*). The preoperative prophylactic dose of cefazolin for a patient >60 kg body weight (BW) is recommended to be 2 g (*Class I, Level of Evidence B*).

When the surgical incision remains open in the operating room, in patients with normal renal function, a second dose of one gram should be administered every 3 to 4 hours. If it is apparent that cardiopulmonary bypass will be discontinued within 4 hours, it is appropriate to delay until perfusion is complete to maximize effective blood levels (*Class I, Level of Evidence B*).

In patients for whom vancomycin is an appropriate prophylactic antibiotic for cardiac surgery, a dose of 1 to 1.5 grams or a weight adjusted dose of 15 mg/kg, administered intravenously (I.V.) slowly over one hour, with completion within one hour of the skin incision is recommended (*Class I, Level of Evidence A*). A second dose of vancomycin of 7.5 mg/kg may be considered during cardiopulmonary bypass although its usefulness is not well established (*Class IIb, Level of Evidence C*).

For patients who receive an aminoglycoside (usually gentamicin, 4 mg/kg) in addition to vancomycin prior to cardiac surgery, the initial dose should be administered within one hour of the skin incision (*Class I, Level of Evidence C*). Redosing an aminoglycoside during cardiopulmonary bypass is not indicated and may be harmful (*Class III, Level of Evidence C*).

Guidelines for Prophylactic Antibiotics in Special Circumstances

Allergy to Penicillin

Recommendations:

In patients with a history of an immunoglobulin E (IgE)-mediated reaction to penicillin or cephalosporin (anaphylaxis, hives, or angioedema),

vancomycin should be given preoperatively and for no more than 48 hours. Alternatively, skin testing may be performed in these patients and if negative, a cephalosporin regimen administered (*Class I, Level of Evidence A*).

For patients with a history of a non-IgE mediated reaction to penicillin (such as a simple rash) or an unclear history either vancomycin or a cephalosporin is recommended for prophylaxis with the understanding that these patients have a low incidence of significant allergic reactions to cephalosporins (*Class I, Level of Evidence B*).

The addition of an aminoglycoside or other gram-negative bacterial coverage to a vancomycin antibiotic regimen may be reasonable, but its efficacy is not well established (*Class IIb, Level of Evidence C*).

Specific Issues Regarding Gram Negative Infections

Recommendations:

For institutions with an outbreak of gram-negative deep wound infections due to a specific pathogen, it is reasonable to employ a first generation cephalosporin for routine prophylaxis (≤48 hours) supplemented with an appropriate antibiotic to which the offending organism(s) is (are) sensitive (*Class IIa, Level of Evidence C*).

In patients with renal dysfunction requiring gram negative prophylaxis to supplement a cephalosporin or vancomycin as the primary antibiotic, it is reasonable to use either one dose of an aminoglycoside or an antibiotic such as levofloxacin with a low incidence of renal toxicity (*Class IIa, Level of Evidence C*).

Topical Application of Antibiotics

Class IIb Recommendation

Topical antibiotics may be considered for antibiotic prophylaxis in cardiac surgery (*Level of Evidence B*).

Summary Conclusions

The primary prophylactic antibiotic for adult cardiac surgery is recommended to be a first generation cephalosporin, which is usually cefazolin. The most frequent organism cultured in cardiac surgical site infection (SSI) is Staphylococcus sp., and colonization is considered the major factor in wound contamination. For this reason, until rapid screening tests for Staphylococcus aureus colonization are widely available, mupirocin is recommended as a routine prophylactic measure. In patients considered at high risk for a Staph infection, vancomycin (one preoperative +/- one additional dose) may be reasonable as an adjuvant agent to the cephalosporin. In patients who are considered beta-lactam or penicillin allergic, vancomycin is recommended as the primary prophylactic antibiotic with additional gram negative coverage. Topical antibiotics may be useful, but the evidence to support their efficacy is limited to three randomized trials.

Definitions:

Levels of Evidence

Level A: Data derived from multiple randomized clinical trials

Level B: Data derived from a single randomized trial or from nonrandomized trials

Level C: Consensus expert opinion

Classification of Recommendations

Class I: Conditions for which there is evidence and/or general agreement that a given procedure is useful and effective

Class II: Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure

IIa: Weight of evidence favors usefulness/efficacy.

IIb: Usefulness/efficacy is less well established by evidence.

Class III: Conditions for which there is evidence and/or general agreement that the procedure is not useful/effective

Clinical Algorithm(s)

None provided

Scope

Disease/Condition(s)

Postoperative infection following cardiac surgery

Guideline Category

Prevention

Clinical Specialty

Cardiology

Infectious Diseases

Internal Medicine

Thoracic Surgery

Intended Users

Physicians

Guideline Objective(s)

To provide guidelines on antibiotic prophylaxis in cardiac surgery, including choice of antibiotics and doses or frequencies of antibiotic administration

Target Population

Adult patients undergoing cardiac surgery

Interventions and Practices Considered

- Selection of antibiotics depending on circumstances and sub-populations
  - Beta-lactam antibiotic: cephalosporin (cefazolin)
  - Glycopeptide (vancomycin)
  - A combination of beta-lactam (cefazolin) with a glycopeptide (vancomycin)
  - Topical antibiotic (mupirocin)
  - Aminoglycoside in combination with vancomycin or cephalosporin
- Appropriate dosing and frequency of prophylactic antibiotics for routine use and in special circumstances

Major Outcomes Considered

- Efficacy, and cost-effectiveness of antibiotics in the prevention of surgical site infections (SSIs)
- Incidence of surgical site infections
- Adverse effects of medications
- Antibiotic resistance

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

2007 Guideline

Not stated

2011 Reaffirmation

A search of the literature from 2006 to June 2011 was conducted using the Cochrane Central Register of Controlled Trials, Ovid Medline, and PubMed databases. The key words and MeSH terms searched were: Cardiac Surgical Procedures and "anti-bacterial agents/administration and dosage" or "antibiotic prophylaxis/standards" or "surgical wound infection/prevention and control" or "cardiac surgical procedures/adverse effects." Seven hundred seventy five records were identified. Titles and abstracts were reviewed by two members of the guideline Task Force to exclude records that were of interest, and the remaining full length articles were reviewed by the two members. The Task Force concluded that data from studies conducted from 2006 to present were not at odds with the recommendations published in the 2007 STS antibiotic choice guideline. The guideline is still valid.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Levels of Evidence

Level A: Data derived from multiple randomized clinical trials

Level B: Data derived from a single randomized trial or from nonrandomized trials

Level C: Consensus expert opinion

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review

Description of the Methods Used to Analyze the Evidence

Not stated

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

Not stated

Rating Scheme for the Strength of the Recommendations

Classification of Recommendations

Class I: Conditions for which there is evidence and/or general agreement that a given procedure is useful and effective

Class II: Conditions for which there is conflicting evidence and/or a divergence of opinion about the usefulness/efficacy of a procedure

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Cost Analysis

Published cost analyses were reviewed.

Method of Guideline Validation

Peer Review

Description of Method of Guideline Validation

Not stated

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of evidence is identified and graded for each recommendation (see "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Use of appropriate type, dose, and frequency of a prophylactic antibiotic regimen in patients undergoing cardiac surgery will minimize surgical site infection and the development of antibiotic resistance.

Potential Harms

Adverse effects of medication, including side effects, allergic reaction, and development of antibiotic resistance

Qualifying Statements

Qualifying Statements

These guidelines should not be considered inclusive of all proper methods of care or exclusive of other methods of care reasonably directed at obtaining the same results. Moreover, these guidelines are subject to change over time, without notice. The ultimate judgment regarding the care of a particular patient must be made by the physician in light of the individual circumstances presented by the patient.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Staying Healthy

IOM Domain

Effectiveness

Identifying Information and Availability

Bibliographic Source(s)

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Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2007 (reaffirmed 2011)

Guideline Developer(s)

Society of Thoracic Surgeons - Medical Specialty Society

Source(s) of Funding

Society of Thoracic Surgeons

Guideline Committee

Workforce on Evidence Based Surgery

Composition of Group That Authored the Guideline

Not stated

Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

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The Society of Thoracic Surgeons (STS) reaffirmed the currency of the guideline in 2011.

Guideline Availability

Electronic copies: Available in from the Society of Thoracic Surgeons Web site .

Print copies: Available from The Society of Thoracic Surgeons, 633 N. Saint Clair St., Suite 2320, Chicago, IL, USA 60611-3658

Availability of Companion Documents

None available

Patient Resources

None available

NGC Status

This NGC summary was completed by ECRI on April 12, 2007. The information was verified by the guideline developer on April 18, 2007. This summary was updated by ECRI Institute on July 28, 2008 following the U.S. Food and Drug Administration advisory on fluoroquinolone antimicrobial drugs. The currency of the guideline was reaffirmed by the developer in 2011 and this summary was updated by ECRI Institute on October 16, 2012. This summary was updated by ECRI Institute on October 24, 2013 following the U.S. Food and Drug Administration advisory on Fluoroquinolone Antibacterial Drugs. This summary was updated by ECRI Institute on May 18, 2016 following the U.S. Food and Drug Administration advisory on Fluoroquinolone Antibacterial Drugs.

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